

# Luxembourg Number Theory Day 2018

18 December 2018, University of Luxembourg

## Location & Schedule

The workshop will take place in Room 6B on 6th Floor of the Maison du Nombre, Campus Belval.

09:30 – 10:30 **Cecília Salgado (Rio de Janeiro)** *Elliptic fibrations on K3 surfaces*

11:00 – 12:00 **Peter Bruin (Leiden)** *Counting elliptic curves over number fields with level structure*

13:45 – 14:45 **Elisa Lorenzo García (Rennes)** *Absolute modular invariants for hyperelliptic curves of genus 3*

15:15 – 16:15 **Christophe Ritzenthaler (Rennes)** *Reduction of plane quartics*

## Abstracts

**Cecília Salgado (Universidade Federal do Rio de Janeiro)** *Elliptic fibrations on K3 surfaces*

I will report on a program to describe elliptic fibrations on K3 surfaces developed in collaboration with A. Garbagnati (U. Milano). We consider K3 surfaces that admit a non-symplectic involution with non-empty fixed locus. We give a method of classification of elliptic fibrations on such surfaces by means of analyzing linear systems on a simpler surface, namely the quotient by the involution. In this talk, I will describe the ideas behind the method and report on a new stage of this project which is directed to some possible applications of both geometric and arithmetic nature.

**Peter Bruin (Universiteit Leiden)** *Counting elliptic curves over number fields with level structure*

A recent theorem of R. Harron and A. Snowden describes the asymptotic behaviour of the number of elliptic curves over  $\mathbb{Q}$  with bounded height and prescribed torsion subgroup. I will explain how this result can be extended to general number fields and general prescribed level structure (image of the Galois representation on the  $n$ -torsion points). An interesting feature of this more general setting is that it leads to using height functions on "stacky" weighted projective spaces, introduced by A.-W. Deng. This is joint work in progress with Filip Najman.

**Elisa Lorenzo García (Université de Rennes 1)** *Absolute modular invariants for hyperelliptic curves of genus 3*

In order to carry out the CM-method for genus 3 hyperelliptic curves one needs "good" invariants for them. The CM-method is an algorithm for constructing curves with CM and with a given number of points over finite fields. We will discuss the meaning of "good" invariants here, that is, having good arithmetic properties, and we will provide a set of invariants with these good properties.

**Christophe Ritzenthaler (Université de Rennes 1)** *Reduction of plane quartics*

Given a smooth plane quartic  $C$  over a discrete valuation field  $K$ , we give a characterization of its reduction type (i.e. smooth plane quartic, hyperelliptic genus 3 curve or bad) over  $K$  in terms of the existence of a special plane quartic model and over the algebraic closure in terms of the valuations of the Dixmier-Ohno invariants of  $C$ . Joint work with Qing Liu, Elisa Lorenzo García and Reynald Lercier.